GROUP 33

FRONT SUSPENSION

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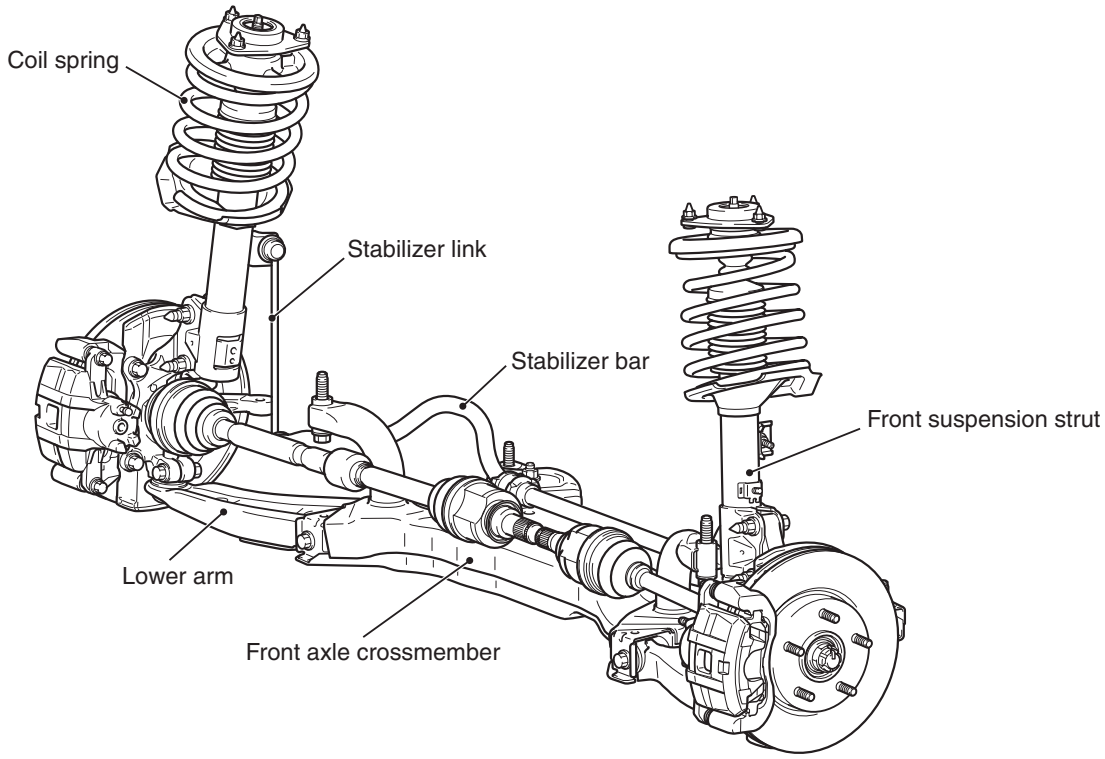
GENERAL DESCRIPTION

M1332000100913

The MacPherson strut type suspension is adopted.

CONSTRUCTION DIAGRAM



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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1332008500272

Item	Specification
Lower arm assembly	
Lower arm to crossmember connection bolt (Front)	110 ±11 N· m (81 ±8 ft-lb)
Lower arm to crossmember connection bolt (Rear)	110 ±11 N· m (81 ±8 ft-lb)
Lower arm to knuckle connection nut	71 ±10 N· m (53 ±7 ft-lb)
Stabilizer bar	
Stabilizer fixture bolt	31 ±4 N· m (23 ±3 ft-lb)
Strut assembly to stabilizer link connection nut	39 ±6 N· m (29 ±4 ft-lb)
Stabilizer to stabilizer link connection nut	39 ±6 N· m (29 ±4 ft-lb)
Strut assembly	
Strut assembly self-locking nut	60 ±9 N· m (45 ±6 ft-lb)
Strut assembly to body connection nut	45 ±7 N· m (33 ±5 ft-lb)
Strut assembly to knuckle connection nut	110 ±11 N· m (81 ±8 ft-lb)
Strut assembly to stabilizer link connection nut	39 ±6 N· m (29 ±4 ft-lb)
Wheel speed sensor clamp nut	13 ±2 N· m (111 ±22 in-lb)
Break hose clamp nut	13 ±2 N· m (111 ±22 in-lb)

GENERAL SPECIFICATIONS

M1332000200329

COIL SPRING

Item		Specification	
		DE, ES	GTS
Wire diameter mm (in)		14 (0.6)	
Average diameter mm (in)		159 (6.3)	
Free length mm (in)	5MT	331 (13.0)	316 (12.4)
	CVT	338 (13.3)	322 (12.7)

SERVICE SPECIFICATIONS

M1332000301040

Item		Specification
Toe-in mm (in)		1 ±2 (0.04 ±0.09)
Steering angle	Inner wheel	40 ° 50' ±1 ° 30'
	Outer wheel (reference)	33 ° 50'
Camber		–0° 05' ±30' (Left/right deviation within 30')
Caster		2 ° 40' ±30' (Left/right deviation within 30')
Kingpin inclination		13 ° 30' ±1 ° 30'
Lower arm ball joint breakaway torque N· m (in-lb)		2.2 –4.1 (19 –36)
Stabilizer link ball joint turning torque N· m (in-lb)		0.5 –2.9 (4.4 –26)

FRONT SUSPENSION DIAGNOSIS

INTRODUCTION TO FRONT SUSPENSION DIAGNOSIS

M1332009000281

If the front suspension is faulty, the vehicle will not run straightforward or noise will occur. Incorrect wheel alignment, malfunction of strut assembly, stabilizer bar, coil spring, or worn or out-of-balance tires can cause these problems.

FRONT SUSPENSION DIAGNOSIS TROUBLESHOOTING STRATEGY

M1332009100277

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a front suspension fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the Symptom Chart and Symptom Procedures.
4. Verify malfunction is eliminated.

SYMPTOM CHART

M1332009400319

Symptom	Inspection procedure	Reference page
Steering wheel is heavy, vibrates or pulls to one side	1	P.33-4
Excessive body rolling	2	P.33-5
Poor ride	3	P.33-5
Unequal ride height	4	P.33-5
Noise	5	P.33-6

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Steering Wheel Is Heavy, Vibrates or Pulls to One Side

DIAGNOSIS

STEP 1. Check the tires.
Refer to GROUP 31, Diagnosis P.31-2.

Q: Are the tires in normal condition?
YES : Replace the tires as necessary, then go to Step 2.
NO : If out of balance, balance the tires as necessary. If excessively worn, replace the tires as necessary and go to Step 5.

STEP 2. Check the wheel alignment.
Refer to P.33-8.

Q: Is the wheel alignment correct?
YES : Go to Step 3.
NO : Adjust it, then go to Step 5.

STEP 3. Check the lower arm ball joint.

Q: Is the ball joint in good condition?
YES : Go to Step 4.
NO : Replace the lower arm assembly, then go to Step 5.

STEP 4. Check the coil spring.

Q: Is the coil spring in good condition?
YES : Go to Step 5.
NO : Replace it, then go to Step 5.

STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 2: Excessive Body Rolling

DIAGNOSIS

STEP 1. Check for broken or deteriorated stabilizer bar.

Q: Is the stabilizer bar in good condition?
YES : Go to Step 2.
NO : Replace it, then go to Step 3.

STEP 2. Check the strut assembly for damage.

Q: Is the strut assembly in good condition?
YES : Go to Step 3.
NO : Replace it, then go to Step 3.

STEP 3. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 3: Poor Ride

DIAGNOSIS

STEP 1. Check for improper tire inflation pressure.
Refer to GROUP 31, On-vehicle Service –Tire Inflation Pressure Check P.31-7.

Q: Is the tire inflation correct?
YES : Go to Step 2.
NO : Adjust it, then go to Step 4.

STEP 2. Check for broken or deteriorated coil spring(s).

Q: Are the coil spring(s) broken or deteriorated?
YES : Replace the coil spring(s), then go to Step 4.
NO : Go to Step 3.

STEP 3. Check for strut assembly damage.

Q: Is the strut assembly damaged?
YES : Replace it, then go to Step 4.
NO : Go to Step 4.

STEP 4. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 4: Unequal Ride Height

DIAGNOSIS

STEP 1. Check for broken or deteriorated coil spring(s).

Q: Is the coil spring(s) broken or deteriorated?
YES : Replace it, then go to Step 2.
NO : Go to Step 2.

STEP 2. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

INSPECTION PROCEDURE 5: Noise

DIAGNOSIS

STEP 1. Check for lack of lubrication.

Q: Is lubrication inadequate?
YES : Lubricate it, then go to Step 5.
NO : Go to Step 2.

STEP 2. Check the tightened parts for looseness as well as the bushings for wear.

Q: Are the tightened parts and bushings in good condition?
YES : Go to Step 3.
NO : Replace it, then go to Step 5.

STEP 3. Check for broken coil spring.

Q: Is the coil spring broken?
YES : Replace it, then go to Step 5.
NO : Go to Step 4.

STEP 4. Check for strut assembly damage.

Q: Is the strut assembly damaged?
YES : Replace it, then go to Step 5.
NO : Go to Step 5.

STEP 5. Retest the system.

Q: Is the malfunction eliminated?
YES : The procedure is complete.
NO : Return to Step 1.

SPECIAL TOOLS

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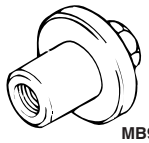
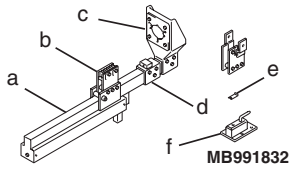
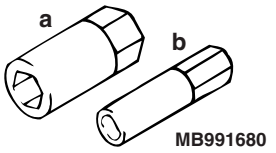
Tool	Tool number and name	Supersession	Appli8cation
 MB991004	MB991004 Wheel alignment gauge attachment	MB991004-01 or General service tool	Wheel alignment measurement
 MB991832	MB991832 a. MB991793 b. MB991795 c. MB991794 d. MB991829 e. MB991831 f. MB991830 Spring compressor set a. Spring compressor b. Attachment A c. Upper plate d. Arm bracket e. Spacer f. Fixture	General service tool	Front coil spring compression *NOTE: The coil spring can not be compressed by following conventional special tools.* • *MB991237 Spring compressor body* • *MB991238 Arm set*
 MB991680	MB991680 a. MB991681 b. MB991682 Wrench set a. Wrench b. Socket	–	Strut assembly disassembly and reassembly

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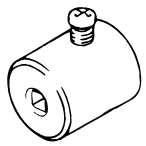
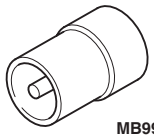
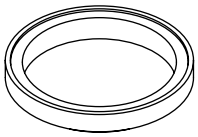
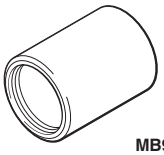
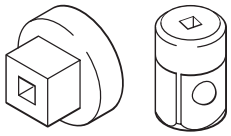
Tool	Tool number and name	Supersession	Appli8cation
 MB991006	MB991006 Preload socket	MB990228-01	Lower arm ball joint breakaway torque check
MB990800	MB990800 Ball joint dust cover installer	MB990800-01or General service tool	Lower arm ball joint dust cover installation
 MB992119	MB992119 Arm bushing & installer	–	Lower arm bushing removal and press-fitting
	MB990979 Ring	–	
 MB990890	MB990890 Rear suspension bushing base	MB990890-01 or general service tool	
 MB990326	MB990326 Preload socket	General service tool	Ball joint turning torque check

ON-VEHICLE SERVICE

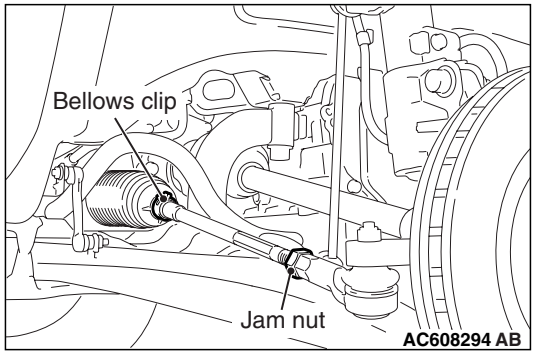
FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

M1331000901124

Measure wheel alignment with alignment equipment on a level surface. The front suspension, steering system, wheels, and tires should be serviced to normal condition before measuring wheel alignment.

TOE-IN

Standard value: 1 ±2 mm (0.04 ±0.09 inch)



1. Adjust the toe-in by undoing the clip and jam nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

   NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.
2. Install the clip and tighten the jam nut to the specified torque.

   Tightening torque: 52 ±2 N· m (38 ±2 ft-lb)
3. Confirm that the toe-in is at the standard value.
4. Use a turning radius gauge to check that the steering angle is at the standard value.

   STEERING ANGLE
   Standard value:
   40° 50' ±1° 30' <Inner wheel>
   33° 50' <Outer wheel (reference)>

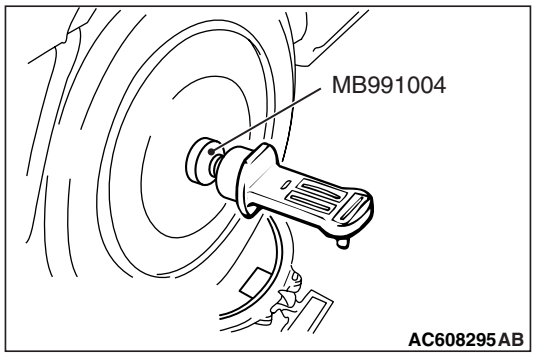
CAMBER, CASTER AND KINGPIN INCLINATION

Required Special Tool:

- MB991004: Wheel Alignment Gauge Attachment <Vehicles with aluminum wheels>

Standard value:
Camber - 0° 05' ±0° 30' (Left/right deviation within 30')
Caster 2° 40' ±0° 30' (Left/right deviation within 30')
Kingpin inclination 13° 30' ±1° 30'

NOTE: Camber and caster are preset at the factory and cannot be adjusted.



⚠ CAUTION

Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

NOTE: For vehicles with aluminum type wheels, attach the camber/caster/kingpin gauge to the driveshaft by using the special tool MB991004. Tighten the special tool MB991004 to the same torque 160 ±16 N· m (118 ±12 ft-lb) as the driveshaft nut.

LOWER ARM BALL JOINT END PLAY CHECK

M1332011300201

1. Raise the vehicle.
2. Remove the stabilizer link from the lower arm.
3. Move the lower arm up and down with your hands to check for an excessive play in the axial direction of the ball joint. If there is an excessive play, replace the lower arm assembly.

BALL JOINT DUST COVER CHECK

M1332008600633

1. Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.
2. If the dust cover is cracked or damaged, replace the lower arm assembly.

   NOTE: If the dust cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

STRUT ASSEMBLY

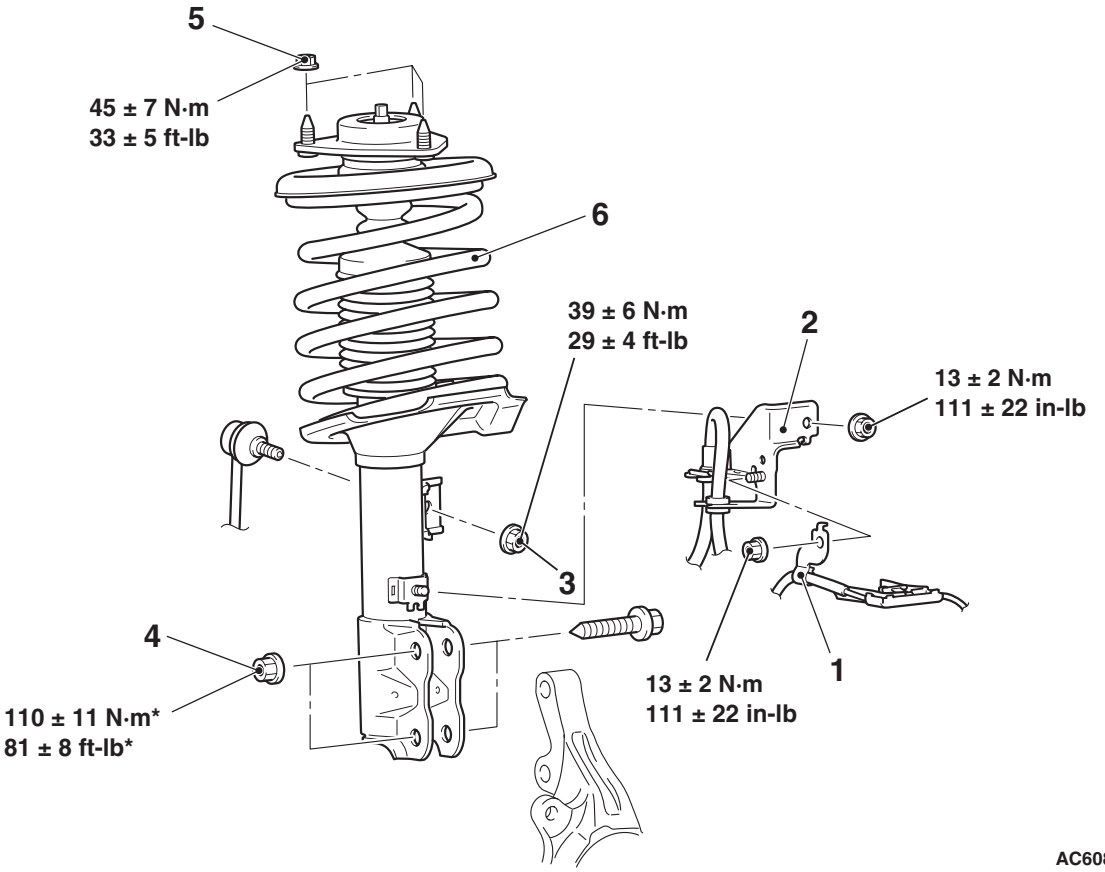
REMOVAL AND INSTALLATION

M1332001100875

⚠ CAUTION

The part indicated by * is the bolt/nut with friction coefficient stabilizer. During removal, ensure there is no damage, clean dust and soiling from the bearing and thread surfaces, and tighten it to the specified torque.

Post-installation Operation
Front Wheel Alignment Check and Adjustment (Refer to P.33-8).



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Removal steps
1. Wheel speed sensor clamp
2. Brake hose clamp
3. Stabilizer link and strut connection

Removal steps (Continued)
4. Knuckle and strut connection
5. Strut mounting nuts
6. Strut assembly

INSPECTION

M1332001200430

- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation.

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DISASSEMBLY AND ASSEMBLY

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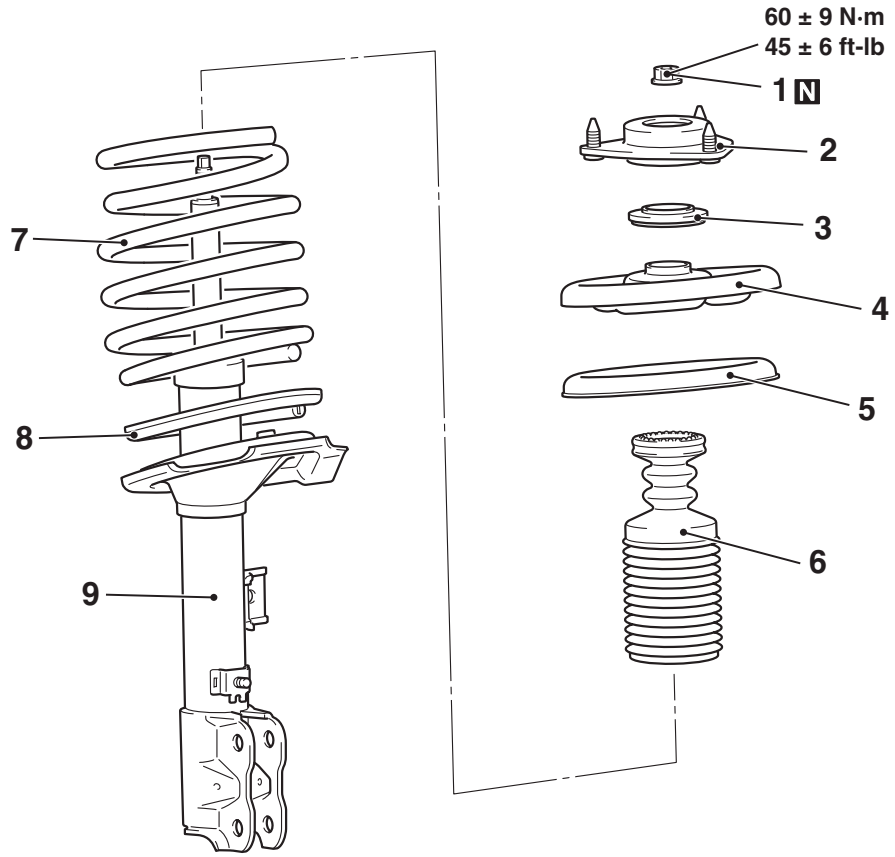

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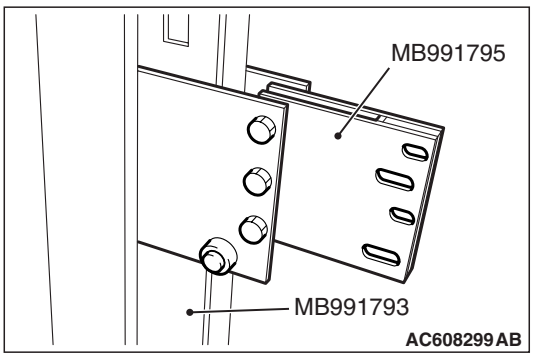
		Disassembly steps			Disassembly steps
<<A>>	>>C<<	1. Strut nut (Self-locking nut)		6. Bump rubber	
		2. Strut insulator assembly	>>A<<	7. Coil spring	
	>>B<<	3. Bearing		8. Spring tube	
		4. Upper spring seat	<<B>>	9. Front suspension strut	
		5. Upper spring pad			

DISASSEMBLY SERVICE POINTS

<<A>> STRUT NUT (SELF-LOCKING NUT) REMOVAL

1. Install the special tool attachment A (MB991795) to the special tool spring compressor (MB991793) as shown in the figure.



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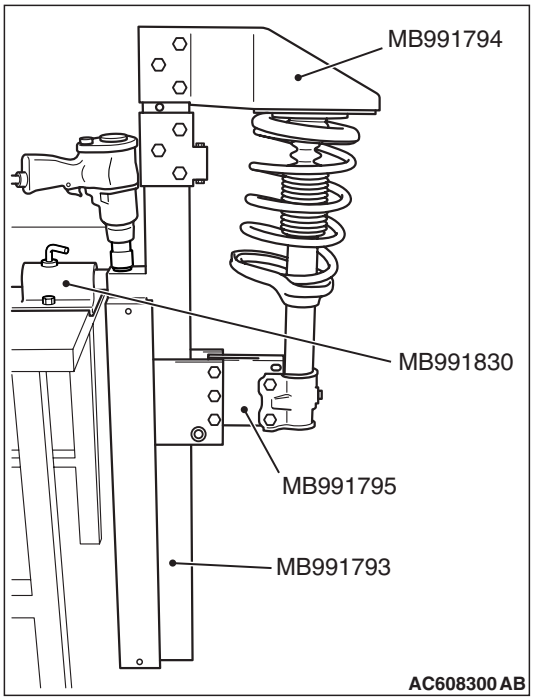
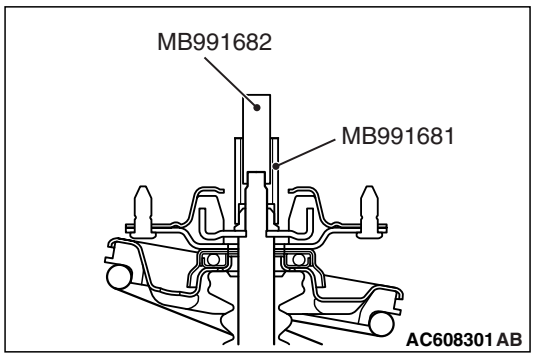


2. Set the strut assembly to the following special tools:
   - Spring compressor (MB991793)
   - Attachment A (MB991795)
   - Upper plate (MB991794)
   - Fixture (MB991830)

NOTE: Use the bolts and nuts removed from the vehicle to secure the strut assembly and tighten them lightly by hand.

3. After steering the strut aseembly, operate the spring compressor and compress the coil spring by approximately 5 mm.



⚠ CAUTION

The locking nut for the piston rod inside the strut may be loose. Do not use the impact wrench to loosen the strut nut (self-locking nut).

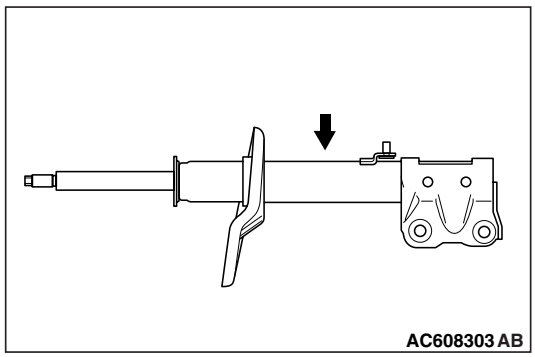
4. Use the following tools to loosen the strut nut (self-locking nut):
   - Wrench (MB991681)
   - Socket (MB991682)

<<B>> STRUT ASSEMBLY REMOVAL

⚠ CAUTION

Wear the protective glasses. Although the gas is harmless, drilling chips may be blown out by the gas.

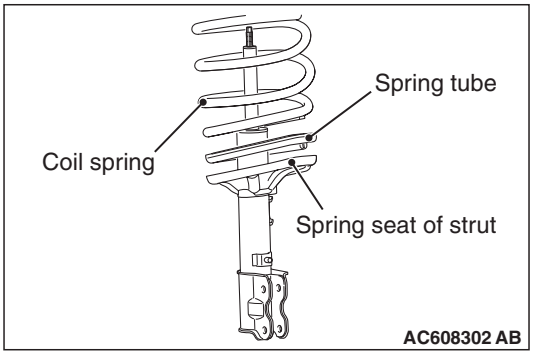
Before disposal of the strut, place the strut on the level surface with the piston rod extended, and make a hole of approximately 3 mm in diameter at the point shown in the figure to discharge the gas.



ASSEMBLY SERVICE POINTS

>>A<< COIL SPRING INSTALLATION

1. Fit the coil spring to the spring tube securely.
2. Install the coil spring equipping with the spring tube to align the bottom with the shape of the strut spring sheet.



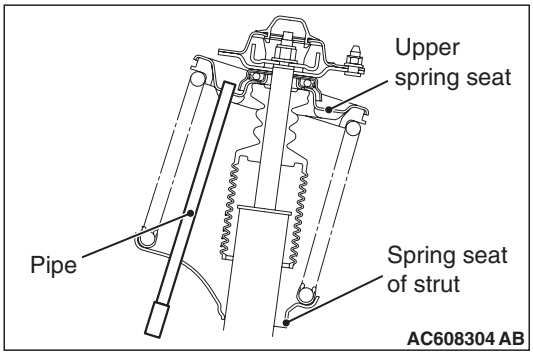
>>B<< STRUT BEARING INSTALLATION

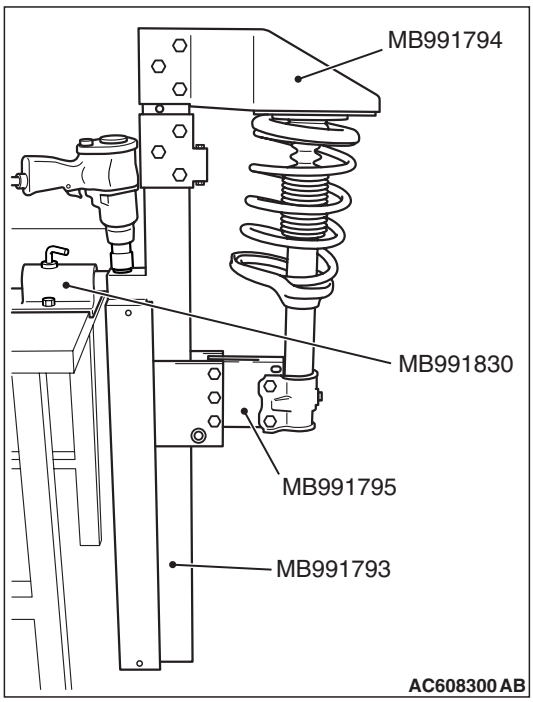
⚠ CAUTION
Install the strut bearing without any damage.

>>C<< STRUT NUT (SELF-LOCKING NUT) INSTALLATION

1. Check that both of the coil spring ends align with the spring sheet groove correctly.
2. Align the strut spring sheet hole with the upper spring sheet hole.

NOTE: Use the pipe to align the holes easily

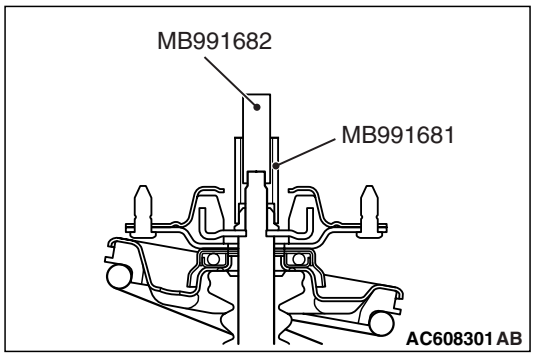




⚠ CAUTION

Be careful that the hand is not pinched by the coil spring when aligning the piston rod with the hole of upper insulator while compressing the coil spring.

3. While passing the strut piston rod through the hole of upper insulator by hand slowly compress the coil spring by the following special tool:
   - Spring compressor (MB991793)
   - Attachment A (MB991795)
   - Upper plate (MB991794)
   - Fixture (MB991830)



⚠ CAUTION

The locking nut for the piston rod inside the strut may be loose. Do not use the impact wrench to loosen the strut nut (self-locking nut).

4. Use the following special tools to tighten the strut nut (self-locking nut) to the specified torque:
   - Wrench (MB991681)
   - Socket (MB991682)

   Tightening torque: 60 ±9 N· m (45 ±6 ft-lb)

INSPECTION

M1332001400315

- Check the bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

LOWER ARM

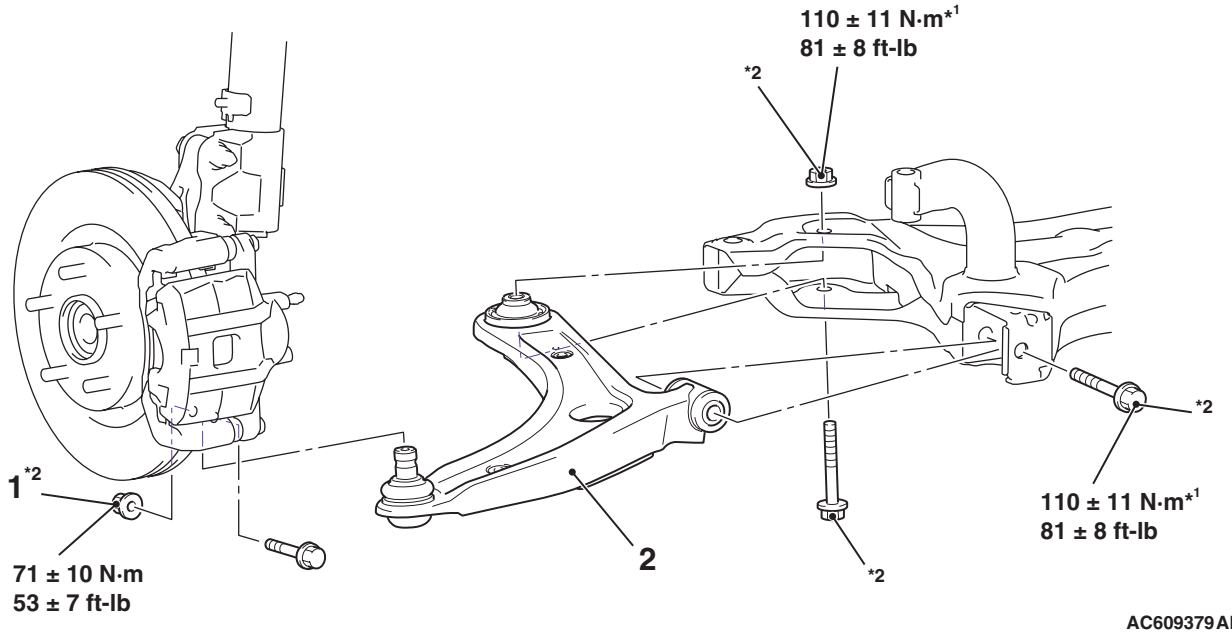
REMOVAL AND INSTALLATION

M1332001601000

⚠ CAUTION

- **The parts indicated by *1 indicates parts which should be temporarily tightened, and then fully tightened with the vehicle standing on the ground and the curb weight condition.**
- **The parts indicated by *2 are the bolts/nuts with friction coeffcient stabilizer. Inremoval, ensure there is no damage, clean dust and soiling from the bearing and thread surfaces, and tighten them to the specified torque.**

Post-installation Operation Engine Room Side Cover (Refer to GROUP 51 –Under Cover P.51-16).	**Post-installation Operation** • Using Your Fingers, Press the Dust Cover to Check for a Crack or Damage. • Using Your Fingers, Press the Dust Cover to Check for a Crack or Damage. • Wheel Alignment Check and Adjustment (Refer to P.33-8).



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Removal steps

1. Lower arm nut

<<A>>

Removal steps (Continued)

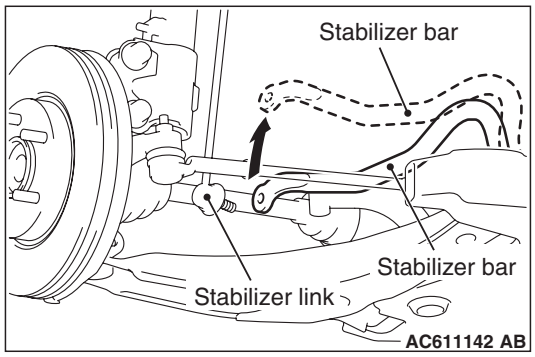
- Stabilizer link and stabilizer bar connection (Refer to P.33-19).

2. Lower arm assembly

TSB Revision

REMOVAL SERVICE POINT

<<A>> LOWER ARM ASSEMBLY REMOVAL



1. Raise up the stabilizer bar as shown in the figure and remove it.

INSPECTION

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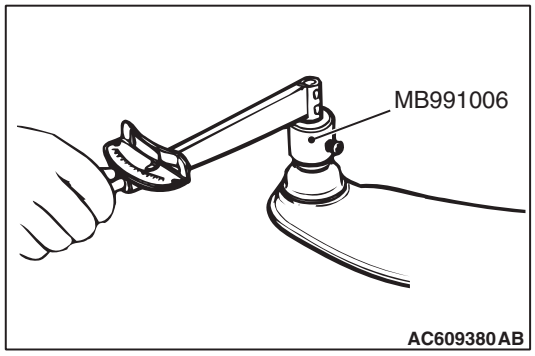
- Check the bushing for wear and deterioration.
- Check the lower arm for bend or breakage.
- Check all bolts for condition and straightness.

LOWER ARM BALL JOINT ROTATION STARTINGTORQUE



1. Move the lower arm ball joint stud back and forth for several times, and measure the lower arm ball joint rotation starting torque using the special tool preload socket (MB991006).

   Standard value: 2.2 –4.1 N· m (19 –36 in-lb)

2. If the measured value exceeds the standard range, replace the lower arm assembly.
3. Even if the measured value is within the standard range, check the lower arm ball joint that there is no looseness or gritty feeling. If there is no looseness or gritty feeling, it is judged as usable.

LOWER ARM BALL JOINT DUST COVER CHECK

1. Using your fingers, press the dust cover to check for a crack or damage.
2. If the dust cover has any crack or damage, replace the lower armassembly.

   NOTE: If the dust cover has a crack or damage, the ball joint could be damaged. If the dust cover is damaged during the maintenance replace it.

LOWER ARM BALL JOINT DUST COVER REPLACEMENT

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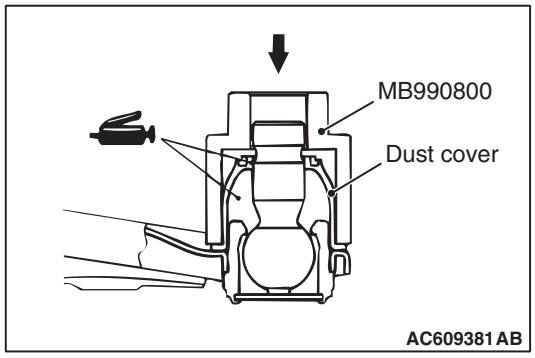
Only when the dust cover is damaged accidentally during maintenance, replace the dust cover as follows:

1. Remove the dust cover.
2. Fill and apply the multi-purpose grease into the inside and lip of the dust cover.

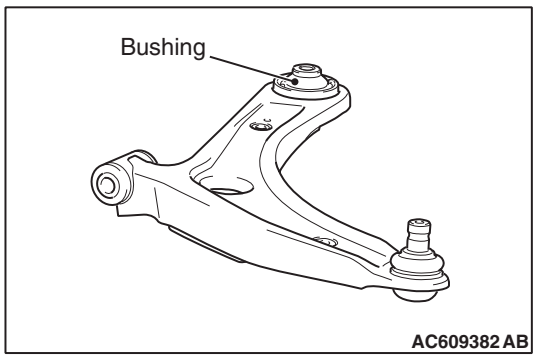


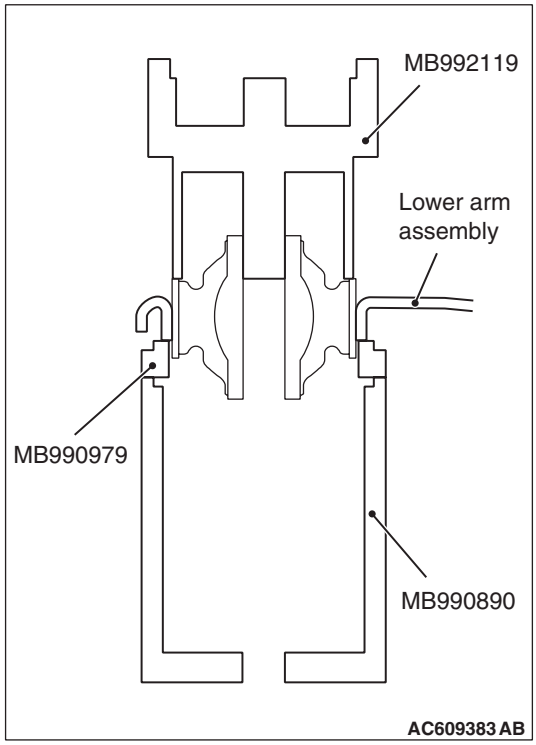
3. Use the special tool ball joint removal & installer (MB990800) to drive in the dust cover to the point where it contact with the lower arm assembly.
4. Using your fingers, press the dust cover to check for a crack or damage.

LOWER ARM REAR BUSHING REPLACEMENT

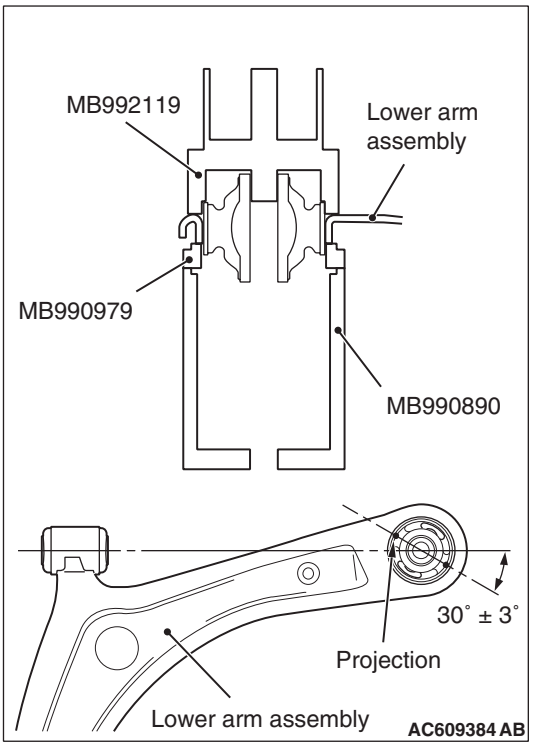
M1332008100713

Replace the back side bushing according to the following procedure.





1. Use the following special tools to remove the bushing:
   - MB992119 (Arm bushing remover and installer)
   - MB990979 (ring)
   - MB990890 (Rear suspension bushing base)

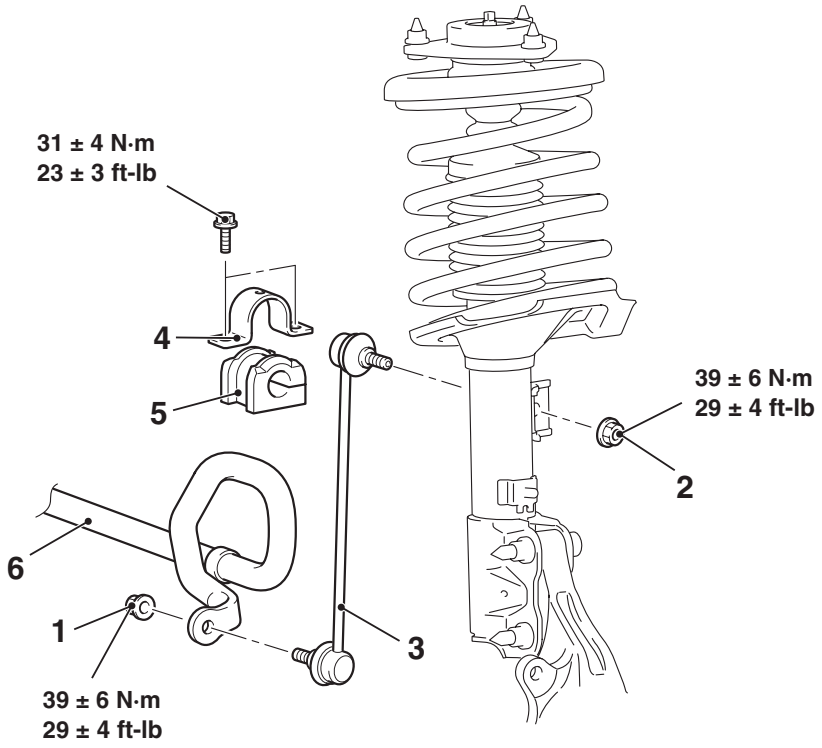


2. Use the following special tools to press-fit the bushing:
   - MB992119 (Arm bushing remover and installer)
   - MB990979 (ring)
   - MB990890 (Rear suspension bushing base)
3. Press-fit the bushing so that the bushing protrusion is in the direction shown in the figure.
4. Press-fit the bushing until the special tool contacts with the lower arm assembly.

STABILIZER BAR

REMOVAL AND INSTALLATION

M1332004000800



AC608293 AB

Stabilizer link removal steps
1. Stabilizer nut
2. Stabilizer nut
3. Stabilizer link

Stabilizer bushing removal steps
1. Stabilizer nut
4. Stabilizer bar bracket
5. Stabilizer bushing

Stabilizer bar removal steps
1. Stabilizer nut
- Front axle crossmember (Refer to GROUP 32 – Crossmember P.32-9).

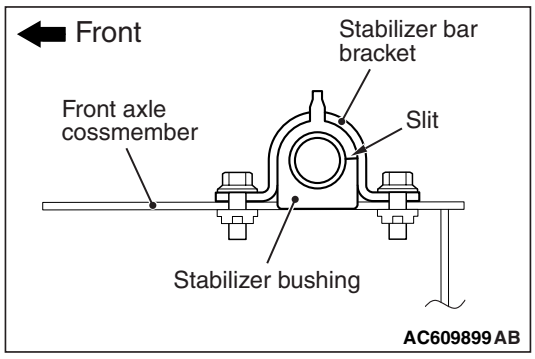
4. Stabilizer bar bracket

>>A<< 5. Stabilizer bushing
6. Stabilizer bar

INSTALLATION SERVICE POINT

>>A<< STABILIZER BUSHING INSTALLATION

Install the stabilizer bushing sa shown in the figure.



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INSPECTION

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- Check the bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

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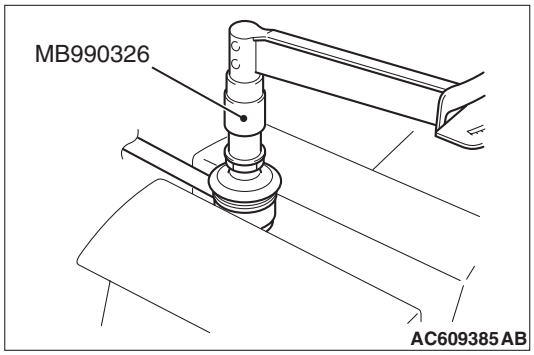

STABILIZER LINK BALL JOINT TURNING TORQUE CHECK

1. Move the stabilizer link ball joint stud back and forth for several times, install the stud with nut, and measure the stabilizer link ball joint rotation starting torque using the special tool preload socket (MB990326).

   Standard value: 0.5 –2.9 N· m (4.4 –26 in-lb)

2. When the measured value exceeds the standard value, replace the stabilizer link.
3. If the measured value stays within the standard range, and there is looseness or gritty feeling, the component is judged as unusable and should be replaced.

STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the stabilizer link.

   NOTE: If the dust cover has a crack or damage, the ball joint could be damage.